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FOREST RESEARCH DIGEST

SEPTEMBER-OCTOBER 1936



U. S. DEPT. OF AGRICULTURE
FOREST SERVICE
LAKE STATES FOREST EXPERIMENT STATION

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LAND USE CONFERENCE

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A conference sponsored by the Upper Peninsula Development Bureau in cooperation with the Michigan Department of Conservation, various governmental agencies, and private timber operators, was held on October 1 and 2. The meeting was attended by approximately 200 persons.

The purpose of this conference was to examine the progress of conservation in general as it related to the Upper Peninsula, and specifically to demonstrate the silvicultural and economic advantages of selective logging.

The conference was started off with a banquet in Marquette on Oct. 1st, at which several speakers addressed the gathering on the various aspects of conservation in the Upper Peninsula. John M. Busch of the Cleveland Cliffs Iron Company presided.

On the second day of the conference, most of those attending took a field trip through the selective cuttings on the Upper Peninsula Experimental Forest, which is one of the branches of the Lake States Station. A number of the permanent sample plots representing several degrees of cutting were visited and the principles involved in true selective logging were explained and demonstrated on the ground.

After spending the day at Dukes, the meeting was transferred to Escanaba and brought to a close by another banquet at which the speakers discussed the plans for the future development of the Upper Peninsula.

* Maintained in cooperation with the University of Minnesota at University Farm, St. Paul, Minnesota.

THE HARDSHIPS OF A SEEDLING'S FIRST YEAR

A recent bulletin* by I. T. Haig, presents the results of a very intensive study of the factors which cause seedling mortality in the first year. Although the species studied were all native to the Northern Rocky Mountain Region, the results obtained are indicative of what can be expected in other regions.

In the spring and early summer biotic agencies such as damping-off fungi, insects (cutworms) and birds were the chief killing factors; later in the season high surface soil temperatures and drought became most important. In an open clear-cut area high temperatures killed a large proportion of the seedlings, while in an uncut stand there were no losses due to this cause. The losses due to drought exhibited exactly the reverse trend and were most severe under the uncut stand. The season for this is attributed to better root penetration of the seedlings grown in the open. It was also found that mortality due to high temperatures was markedly greater on duff soil surfaces than on mineral soil surfaces.

It is probable that on the sandy soils of the Lake States some of these conclusions will not hold. But the bulletin is well worth the study of all those interested in the early survival of seedlings because it presents the results of a careful study in which an adequate amount of instrumental data was available to explain the effects observed. When the many lethal factors which must be faced by a seedling during its first year in the field are known, the reason for the great prodigality of seed production is easily understood.

SQUIRRELS VERSUS JACK PINE

The old trick of putting a brick on a boy's head to keep him from growing too tall has its counterpart in the height growth of jack pine. In 1926, the Station made height measurements on about one thousand 60 year-old jack pine trees on the Superior National Forest. Five years later, when these trees

* I. T. Haig, "Factors Controlling Initial Establishment of Western White Pine and Associated Species." Bul. No. 41, Yale University: School of Forestry.

were remeasured, it was found that they had made practically no height growth. This fall the trees were remeasured again, and although the measurements were checked carefully, there had apparently been no gain in height.

A few trees had grown as much as five feet but a sufficient number had lost from one to three feet to make the average growth zero.

Two trees were felled adjacent to one of the plots and it was found that they had grown only 5 feet in 19 years and 18 years respectively. Examination of the tops showed that squirrels have been cutting off the terminal shoots in the upper branches almost every year with the result that the average annual height growth has been only three inches. In the last nine years, one of these trees made only one and one-half feet, or at the rate of two inches per year.

SUCCESSION DEMONSTRATED

A striking demonstration of the forest history of central New England has been prepared under the direction of members of the Harvard Forest School*. A series of eight very accurate models depict the forest in eight successive stages. The models were constructed by a firm specializing in this work and their natural appearance is indeed a tribute to the skill of the craftsmen who made them.

The needles of the conifers and leaves of the hardwoods are made from sheet copper, attached to fine wires which are combined to form branches. Human figures are modeled from wax.

The forest models are divided into two series; the first shows the forest in its primeval condition. This is followed by two models showing advancing stages of land clearing and cultivation. The next depicts the period of farm abandonment which is then followed by a crop of pure white pine. This second growth white pine was cut and the land left to take care of itself. The next crop was sprout hardwoods and this is the stage which is now dominant over much of New England.

The second group consisting of eight models is called the silvicultural series and depicts various silvicultural measures

* "The Harvard Forest Models." Publishd by the Harvard Forest on the occasion of the Tercentenary Celebration of Harvard University.

which have been found suitable for reclothing the New England hills with a new suit of valuable white pine timber.

These models will eventually be permanently installed in the proposed Fisher Museum of Forestry at Petersham, Massachusetts.

MINNESOTA FORESTS SHOW INCREASED GROWTH

Preliminary Forest Survey figures for the northern districts of Minnesota show a much more rapid rate of timber growth than was credited in estimates of five or ten years ago. A large share of this growth is accumulating on small aspen, jack pine and balsam trees which have come in on the cut-over lands since reasonably good fire protection organizations have been placed in the field.

The fact that there is this much growth on lands which have been severely abused and are still badly understocked is good evidence of the possibilities of self sufficiency in timber production if the entire forest area of Minnesota were given good protection and reasonable care.

The growth estimates for four districts, including all of the land in the northeastern forest area follow:

Current Growth in Four Minnesota Districts-1935

District	Acreage Forest Land	Annual growth	
		Bd. Ft. Per Acre*	Total MBM*
Cloquet	4,329,900	16	67,887
Rainey River	3,808,400	22	82,225
Superior	2,030,700	86	175,042
Central Pine	5,284,900	28	149,732
Total	15,453,900	31	474,886

*Lumber Scale

EARLY ROOT DEVELOPMENT OF COTTONWOOD

A recent examination by J. H. Stoeckler of the root systems of a number of plants native to the sand dune area around Denbigh, North Dakota, revealed the fact that 2 year-old cottonwood trees have root systems extending as much as six or seven feet deep in these sandy soils. Undoubtedly this abil-

ity to develop a deep root system at an early age plays a considerable part in the establishment of this species under very adverse conditions.

MORE ABOUT JACK PINE SEEDS

The October 1935 issue of the Research Digest reported the results of a study of the yield of seeds from an acre of jack pine on the Chippewa National Forest. Since then, a similar study has been made at the Superior Branch Station.

In both cases, the method consisted of felling an acre of 65-year-old jack pine and collecting the cones. As the cones were collected, they were sorted into the following four classes based upon dates of maturity; 1935, 1934, 1933-32, and 1931 and older. Afterwards, the seeds were extracted, cleaned and measured.

The table below shows the results of both projects. It should be noted that the quantity of cones collected on the Chippewa was somewhat higher than on the Superior but this was compensated for by a higher recovery of seed. The yields of seeds are so nearly the same that the difference might be accounted for by slight differences in kiln temperatures and cleaning techniques.

Yield of Jack Pine Cones and Seeds
Chippewa and Superior National Forests
(based on 1 acre samples from 65-year-old stands)

Date of maturity of cones	Bu. of cones per acre		Ozs. of seed per bushel		Lbs. of seeds per acre	
	Chip.	Sup.	Chip.	Sup.	Chip.	Sup.
1935	2.92	2.78	5.71	10.05	1.04	1.75
1934	5.11	1.74	9.35	9.23	2.99	1.01
1933-32	4.17	2.69	6.00	8.25	1.56	1.39
1931 and older	26.33	24.14	4.44	6.19	7.31	9.35
TOTAL	38.53	31.35			12.90	13.50

In terms of number of seeds, the Superior sample amounted to 2,222,000 seeds per acre or 50 seeds per square foot.

SOUTH DAKOTA FORESTRY REPORT RELEASED

Some of the findings of the forest reconnaissance of South Dakota will come as a surprise to those who have always considered this a treeless state. The survey was made during the summer of 1935 by E. R. Ware, Ass't. Forest Supervisor of the Black Hills National Forest under the direction of the Lake States Forest Experiment Station.

One acre of forest for every ten acres of crop land, a total of 47,000 plantations or practically one plantation on every second farm, nearly three billion feet of pine sawtimber or three-fourths as much as now remains in Minnesota; these are some of the outstanding findings of the survey. Other points of interest are the following:

1. Under the Timber Culture Act, which was in effect from 1873-1891, some 13,300 plantations were made in South Dakota. At the present time 24 percent are still in existence but the acreage has shrunk to twelve and a half percent of the original. These plantations were not properly made, poor species were used, and they are now quite old. The average age of the remaining plantations is 51 years and the trees are generally decadent.

2. Under the stimulus of local tree bounty laws and Clarke-McNary Act cooperation 33,700 additional plantations have been set out. Due to the selection of wrong species and to the effects of recent drouths, these plantations likewise are badly depleted. As a broad State average 19 percent of of the trees are dead and an additional 26 percent are dying.

3. Well selected planting stock particularly of green ash, Russian olive, Chinese elm and caragana have survived the drouths remarkably well. Cottonwood, American elm and box-elder have continued to thrive in favorable localities.

4. The bulk of the merchantable timber volume is in the Harney, Custer and Black Hills National Forests in the extreme western part of the state.

5. Annual cut and annual growth of wood in South Dakota compare about as follows:

	Total Cut M. cu. ft.	Total Growth M. cu. ft.
Plantations	3,707	2,580
Native Hardwoods	2,139	7,150
Coniferous Forests	9,031	12,883
	<hr/> 14,877	<hr/> 22,613

Recommendations which grow out of this situation have to do mainly with improving the tree plantations in the eastern part of the state. The opportunity is pointed out to improve the area and quality of these plantings by (1) private initiative without public aid, (2) State subsidies or tree bounties, (3) federal aid under Shelterbelt program, (4) federal and state cooperation under Clarke-McNary Act or similar farm forestry plan.

Copies of the complete report may be obtained upon request addressed to Lake States Forest Experiment Station, University Farm, St. Paul, Minnesota.

DOES PROTECTIVE COLORATION EXTEND TO TREE SEED?

Protective coloration of animals is a well established fact, now it appears that examples of this principle may even be found in tree seeds.

Foresters familiar with the Lake States species of pines, know that jack pine seed is dull black in color, in contrast to the light brown or reddish brown colors of the other native species, white pine, and Norway pine. R. K. LeBarron of the Experiment Station offers the suggestion that this is an example of protective coloration rather than an accident of nature.

Norway pine and white pine seeds fall at the same time or soon after the annual shedding of old needles. It will be recalled that the dead needles are very similar in color to the seeds. Jack pine seeds, on the other hand, fall in large quantities only after a forest fire has swept through the stand. In that case, what could be better protection from the eyes of birds than dull black seed coats which are almost identical in color with charcoal?

EUROPEAN PLANTING PRACTICES*

Ground preparation prior to planting is the rule in Europe. Either scalping or plowed furrows are ordinarily used. The scalps are approximately 15 to 18 inches square, and deep enough to remove competing roots. The furrows are usually about 3 inches deep and 12 to 14 inches wide.

* This is the fifth of a series of articles on European forestry practices by H. L. Shirley.

Most of the conifers are planted in the spring, but in the case of stock produced in a local nursery near the planting site, planting may be done in the fall or at other favorable times of year.

The spacing in plantations varies a great deal from place to place. The common spacing for spruce is approximately one-and-a-half by four-and-a-half feet. Pine is usually spaced a little wider in the rows, with intervals between rows of approximately four-and-a-half feet. Beech, oak and birch are ordinarily set considerably closer, in many cases the rows being only three feet apart or less. Oaks and beech are also frequently established by direct seeding.

A rather large part of the expense of planting is due to the need for protecting the planted trees from injury by game. Hardwoods are usually protected by fencing. Conifers, particularly spruce, may be given protection by applying tar to the stem and needles. Fresh applications are required annually until the trees attain sufficient height to be free from browsing by roe deer or rabbits. After trees have attained a diameter of 2 to 6 inches, they are subject to injury by stags which pull the bark off with their teeth, probably because their diet is deficient in some important element. To protect the trees from the stags, dead branches of spruce are often tied around the stem at a height normally subject to injury by this animal.

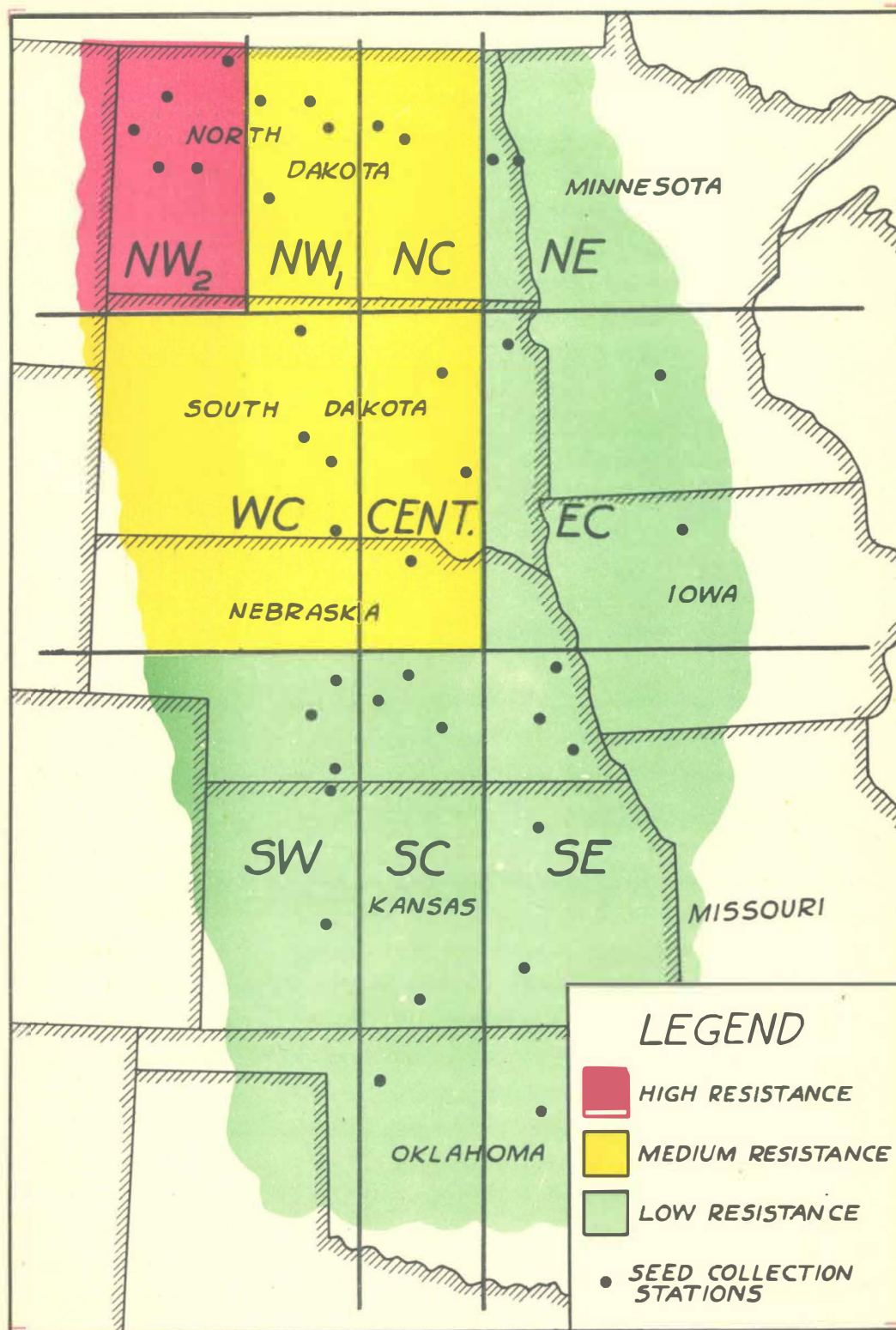
The plantations are weeded annually, if necessary, to prevent overtopping by competing vegetation. This is usually done in August, but may be done twice a year if the trees are small. The number of weedings required is diminished considerably by the use of comparatively large stock (2-2 for spruce) and by close spacing which causes early closing of crowns.

Losses incurred during the first year are ordinarily replaced. The cost of planting varies considerably, but is often as high as thirty dollars per acre.

SEED SOURCE INFLUENCES DROUGHT RESISTANCE OF GREEN ASH

A recently completed laboratory test of the drought resistance of a large number of green ash seedlings shows that there is considerable difference in the ability of green ash to withstand drought, depending upon the locality in which the seed was collected. In 1934 green ash seed was collected from many different stations scattered widely throughout what is

DROUGHT RESISTANCE OF GREEN ASH



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known as the "Shelterbelt Zone". The accompanying map shows the location of the collections. The stations were combined into regions as outlined on the same map.

Seeds from all stations were sown in the greenhouse and when the plants were about one year old, test plants were carefully selected on the basis of general appearance of vigor. These plants were then subjected to controlled conditions of drought in a specially constructed drought machine. The order in which the plants died was recorded and a scoring system devised in which greater drought resistance was indicated by higher scores.

Average scores for the ten regions were computed, and statistically significant differences between the regions were found. In general the drought resistance is least along the eastern and southern edges of the Shelterbelt Zone and increases both westward and northward. The most resistant plants were produced from seed collected in northwestern North Dakota.

FIRE DANGER STATIONS INSTALLED

Region Nine has established a number of fire danger stations during the past summer. The purpose of these stations is to furnish accurate data upon which to base estimates of fire danger. Each National Forest has at least one such station and some forests have more. The stations are equipped with instruments for the measurement of temperature, wind velocity, precipitation, relative humidity and fuel moisture.

J. A. Mitchell of the Experiment Station and Thomas Lotti assigned by the Region to supervise this work are at present making an inspection of these stations to check the present installations, answer questions, and make recommendations for future work along this line.